

GREENHOUSE EFFECT
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The greenhouse effect is unquestionably real, and is essential for life on Earth. It is the result of heat absorption by certain gases in the atmosphere (called greenhouse gases because they trap heat). Water vapor is the most important greenhouse gas, followed by carbon dioxide and other trace gases. Without a natural greenhouse effect, the temperature of the Earth would be about zero degrees F (-18°C) instead of its present 57°F (14°C). However, the concern is not with the fact that we have a greenhouse effect, but it is with the question regarding whether human activities are leading to an enhancement of the greenhouse effect.

Global surface temperatures have increased about 0.6°C (plus or minus 0.2°C) since the late-19th century, and about one half degree F (0.2 to 0.3°C) over the past 25 years (the period with the most credible data). Some areas (including parts of the southeastern U.S.) have cooled. The recent warmth has been greatest over N. America and Eurasia between 40 and 70°N.

An enhanced greenhouse effect is expected to cause cooling in higher parts of the atmosphere because the increased "blanketing" effect in the lower atmosphere holds in more heat. Cooling of the lower stratosphere (about 30-35,000ft.) since 1979 is shown by both satellite Microwave Sounding Unit and radiosonde data.

There has been a general, but not global, tendency toward reduced diurnal temperature range (the difference between high and low daily temperatures) over about 50% of the global land mass since the middle of the 20th century. Cloud cover has increased in many of the areas with reduced diurnal temperature range. Indirect indicators of warming such as borehole temperatures, snow cover, and glacier recession data, are in substantial agreement with the more direct indicators of recent warmth. Arctic sea ice has decreased since 1973, when satellite measurements began.

Human activity has been increasing the concentration of greenhouse gases in the atmosphere (mostly carbon dioxide from combustion of coal, oil, and gas; plus a few other trace gases). There is no scientific debate on this point. Pre-industrial levels of carbon dioxide (prior to the start of the Industrial Revolution) were about 280 parts per million by volume (ppmv), and current levels are about 370 ppmv. According to the IPCC (Intergovernmental Panel on Climate Change) "business as usual" scenario of carbon dioxide increase (IS92a) in the 21st century, we would expect to see a doubling of carbon dioxide over pre-industrial levels around the year 2065.

In recent years some researchers see the greenhouse effect as a significant contributing factor to the current global warming, due to the increased concentration of some greenhouse gases in the atmosphere as a result of human activity. Such climatologists are concerned that increased levels of greenhouse gases in the atmosphere might cause more heat to be trapped. The hypothesis that a man-made increase in greenhouse gas concentration would lead to a higher global temperature was first postulated in the late 19th century by Swedish chemist and 1903 Nobel Laureate Svante Arrhenius, although, his peers largely rejected that theory.

The theory that human greenhouse gas emissions are connected with the observed heating of the Earth's atmosphere in the 20th century has steadily gained adherents in the popular community since the 1980s, to the extent that many bodies around the world have strongly endorsed it. Automobile exhausts, coal-burning power plants, factory smokestacks,

and other waste vents of the industrial age now pump six billion tons of carbon dioxide and other greenhouse gases into the earth's atmosphere each year.

Concentrations of human-influenced greenhouse gases in the atmosphere are currently at approximately 25% above pre-industrial values. This is considerably higher than at any time during the last 420,000 years. From less direct geological evidence, it is believed that values this high were last attained 40 million years ago. Since the last Ice Age, the Earth has had a lower temperature than usual, so discussion about recent warming since the Little Ice Age continues.

On 11 December 1997 in Kyoto, Japan the Kyoto Protocol was initially adopted. It entered into force on 16 February 2005. As of November 2009, 187 states have signed and ratified the protocol. It is a protocol to the United Nations Framework Convention on Climate Change (UNFCCC or FCCC), aimed at fighting global warming. The UNFCCC is an international environmental treaty with the goal of achieving "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system."

Under the Protocol, 37 industrialized countries (called "Annex I countries") commit themselves to a reduction of four greenhouse gases (GHG) (carbon dioxide, methane, nitrous oxide, sulphur hexafluoride) and two groups of gases (hydrofluorocarbons and perfluorocarbons) produced by them, and all member countries give general commitments. Annex I countries agreed to reduce their collective greenhouse gas emissions by 5.2% from the 1990 level. Emission limits do not include emissions by international aviation and shipping, but are in addition to the industrial gases, chlorofluorocarbons, or CFCs, which are dealt with under the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer.

The Protocol allows for several "flexible mechanisms", such as emissions trading, the clean development mechanism (CDM) and joint implementation to allow Annex I countries to meet their GHG emission limitations by purchasing GHG emission reductions credits from elsewhere, through financial exchanges, projects that reduce emissions in non-Annex I countries, from other Annex I countries, or from annex I countries with excess allowances.

Each Annex I country is required to submit an annual report of inventories of all anthropogenic greenhouse gas emissions from sources and removals from sinks under UNFCCC and the Kyoto Protocol. These countries nominate a person (called a "designated national authority") to create and manage its greenhouse gas inventory. Countries including Japan, Canada, Italy, the Netherlands, Germany, France, Spain and others are actively promoting government carbon funds, supporting multilateral carbon funds intent on purchasing carbon credits from non-Annex I countries, and are working closely with their major utility, energy, oil and gas and chemicals conglomerates to acquire greenhouse gas certificates as cheaply as possible.